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ON THE SYSTEMATIC POSITION OF THE SAND GROUSE (PTEROCLES; SYRRHAPTES).

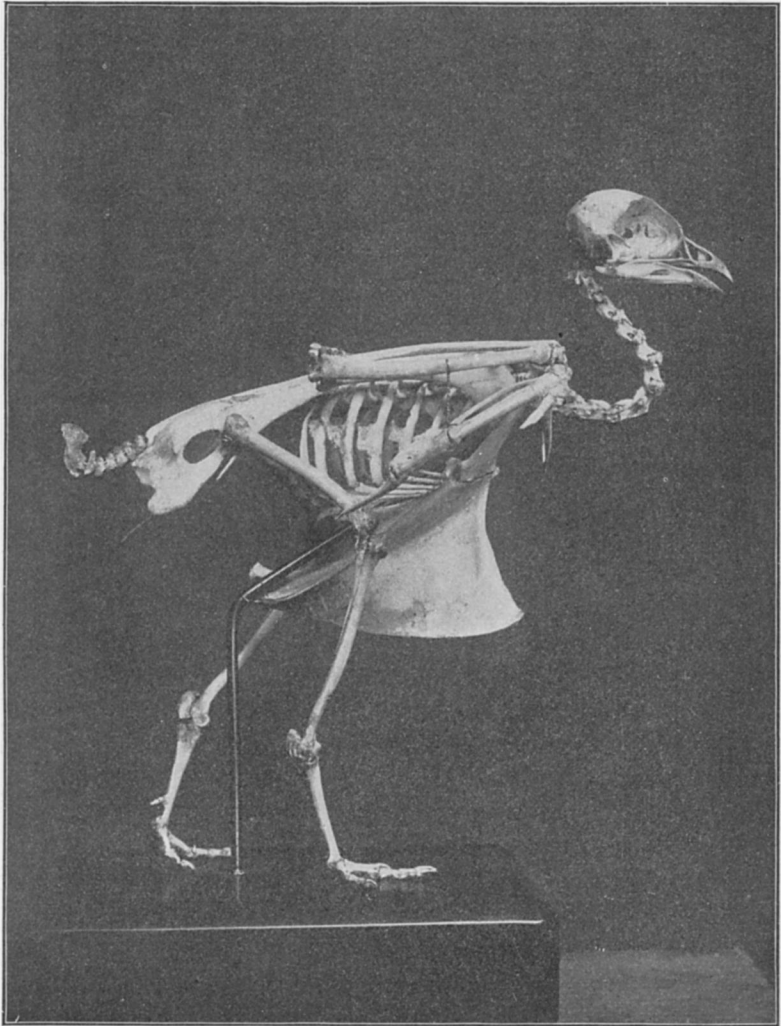
R. W. SHUFELDT.

THERE has been no question for many years past, in the minds of avian taxonomers, as to the general affinities of these birds. This opinion may be briefly stated by saying that the sand grouse constitute a small assemblage of forms, related on the one hand to the gallinaceous birds, and on the other to the pigeons.

Some authors have relegated them to a distinct group, placing it in their schemes of classification between the fowls and the Columbæ. Huxley created the Pteroclomorphæ for them, and Sclater, regarding them as a family, Pteroclidæ, placed them in the order Pterocletes, standing between the Columbæ and the Gallinæ, and in this he has been followed by Stejneger and others. Garrod, Fürbringer, and other authorities, again, have arrayed them with the pigeons. Numerous papers have been devoted to their osteology, but the best of these is doubtless the one given us years ago by William Kitchen Parker, in the *Transactions of the Zoölogical Society of London* (V, 149), where they are treated in his memoir entitled "On the Osteology of the Gallinaceous Birds and Tinamous." The plates to his memoir illustrate the skeleton of *Syrrhaptes paradoxus*, while in the text we have a more or less extensive comparison of the osseous system of this species with that of *Pterocles arenarius*. Parker's figures are very helpful, and in addition to them I have examined some bones of Syrrhaptes loaned me by Professor Alfred Newton, F.R.S., and there are also at hand the mounted skeleton (see plate) and disarticulated one of *Pterocles arenarius*, belonging to the collections of the United States National Museum, and other material.

One has but to glance at the skull of Pterocles to be satisfied that the bird is not a pigeon, while, on the other hand, it

brings to mind the skulls of some of the smaller grouse or ptarmigans. The cervico-dorsal region of the skeleton also is by no means truly columbine, though without difficulty we can



Skeleton of Sand Grouse (*Pterocles arenarius* Pallas). No. 18,849, Coll. U. S. Nat. Museum.
Reduced about one-third.

see the pigeon in the pectoral limb, the sternum, the pelvis, the ribs perhaps; but to a less extent in the shoulder girdle and the bones of the pelvic extremities.

The form of the premaxillary is gallinaceous, the sutural traces of its proximal frontal process being distinct throughout life over the facial frontal region in the middle line, as we see it in many fowls. The large narial openings are elliptical in outline, and made even more so by a curled osseous extension upon either side of the inner nares, that is, above and in front of the very large *pars plana*, below and in front of the frontal, touching the nasal externally and the premaxillary internally, while its upper part, with its free anterior edge, is in full view upon superior aspect of the skull. A few small, irregular vacuities may occur in the interorbital septum, but the good-sized orbit has upon all sides well-defined bony walls, the frontal roof overhead being well produced, the *pars plana* large and concaved upon its posterior aspect, the anterior part of the brain-case complete; while quadrate, pterygoid, and palatine afford a fairly good osseous floor.

The postfrontal processes are more or less aborted, and the squamosal ones are thin and lamelliform, as in the chickens, — the two apophyses not coming in contact distally.

At the base of the skull the palatines are of extremely slender construction, and widely separated from each other in the middle line. They do not even come in contact across the sphenoidal rostrum, which latter is much thickened and rounded, being pointed anteriorly, where it is carried beyond the *pars plana*.

Either maxillo-palatine is a mere rudimentary spine, so small that the thread-like anterior rod of the corresponding palatine almost conceals it from view, when the skull is looked at from this side. A pterygoid is also very slender, and presents a somewhat flattened sigmoid curve at its middle part. These bones articulate with pteryapophysial processes at the cranium's base. No vomer seems to be present, and the nasal septum is but very imperfectly performed in bone.

The zygomatic arches are slender and straight, while the quadrates are well developed and present no very unusual characters.

The mandible, of a V-pattern, resembles to no small extent that bone in some of the smaller ptarmigans (*Lagopus*). A

good-sized ramal vacuity is present in either ramus, and the straight and blunt angular processes are considerably produced.

Kitchen Parker has said the "differences between the skull of *Pterocles arenarius* and *Syrrhaptes paradoxus* are not great, but are important. The head and face of the former are altogether stronger, more gallinaceous and less pigeon-like, than in the latter. The skull base has, in the *Pterocles*, that peculiar breadth which arises from the struthiousness of its structure. The upper frontal region is broader between the eyes, and the alæ of the ethmoid swell up to a greater extent between the crura of the nasal. The postorbital and squamosal processes are much stronger, and make a thicker bridge over the temporal fossa. The crossing of the posterior and horizontal semicircular canals project in the same hemispherical manner as in *Syrrhaptes*, and the tympanic ala of the lateral occipital is equally arrested."

"The molar arch is stronger, and the central interorbital space is filled up;¹ so also are the orbito-frontal fontanelles; the common optic foramen is more closely and neatly circumscribed. There is still an oval slit, opening into both orbits, between the ethmoid bar and the lower edge of the frontals at their coalescence. The antorbital lachrymal mass is equally large, and the septum nasi as well developed and as completely ossified.²

"The bones of the face generally are quite as strong as in ordinary pigeons, and therefore a degree beyond what is seen in *Syrrhaptes*. The double head of the os quadratum agrees with the same structure in *Syrrhaptes*, and there is nothing special to remark upon in the bones of the palatine region. The lower jaw is altogether stronger and deeper, its bend is more marked and further back, than in that of *Syrrhaptes*; the membranous space is of about the same size, as are also the angular processes."³ There is an excellent account of the skull of *Syrrhaptes*, including the bones of the tongue, etc., in the work of Professor Parker just quoted. It is interesting to

¹ Not so in all specimens. — R. W. S.

² The septum narium does not always completely ossify in all individuals of this group; it may, however, do so in the skulls of very old specimens. — R. W. S.

³ On the Osteology of Gallinaceous Birds and Tinamous (p. 204).

note that in *Syrnhaptes* there are sixteen cervical vertebræ; fifteen in *Pterocles arenaria*; and but fourteen in *Ectopistes migratorius*. Again, in *Syrnhaptes*, *three* of the dorsal vertebræ coössify into one piece, the fourth dorsal remaining free. This agrees with *Ectopistes*; while in *Pterocles arenarius*, *four* dorsals coössify to form a single piece, and posterior to this another free dorsal vertebra is found, making five. This, with many similar points in its skeleton, goes to show that *Syrnhaptes* is nearer the pigeons than is *Pterocles*; yet neither of these forms are truly columbaceous.

In the pelvis of either genus we find just such a bone as we should expect to find in birds that are doubtless typical intermediates, standing directly in their organization between two well-circumscribed groups. In the sand grouse, however, the lateral portions of the pelvic sacrum, at its widest part, fail to ossify, and thus, in the dried skeleton, leave large vacuities in that region not seen in tetraonine nor typical columbine birds.

There is usually one less *sacral* vertebra in pigeons than there is in the sand grouse, the former having fourteen, while *Syrnhaptes* and *Pterocles* have fifteen; and Parker claims that the last has but six vertebræ in its tail, and this is all I find in *Ectopistes*, while *Columba livia* and *Pterocles arenarius* each possess seven.

Professor Parker is correct when he says, "I do not set much value on the number of caudal vertebræ, as the last is a series, and the tail is very apt to vary in the number of those which shall be swallowed up in this terminal piece."

The epipleural processes on the ribs are much broader and deeper in *Pterocles arenarius* than they are in *Ectopistes* and other pigeons.¹

In *Pterocles* the scapulæ are long, narrow, and tapering, reaching, in fact to some extent overreaching, the ilia of the pelvis posteriorly. In *Ectopistes* these bones are cimeter-

¹ In the autumn of 1899 Professor C. O. Whitman requested me to write out for him a complete account of all the species of the North American pigeons, in so far as their osteology was concerned, as a contribution to the *Journal of Morphology*. This I did, illustrating the memoir with several figures of the bones of the birds of that group, and a number of the points referred to in the present paper will therein be illustrated. It was accepted for publication and will in due course appear in the aforesaid journal, probably some time in 1901. — R. W. S.

shaped, and both dilated as well as truncated behind, where they do not reach the ilia by any means. *Pterocles* has a very insignificant fourchette in its shoulder girdle, slender and of a U-pattern. Its clavicular ends articulate with the scapulæ. This they fail to do in all the pigeons I have examined, where the bone has much the same form and slenderness, but reaches a great deal farther down towards the carinal angle of the sternum. As already stated above, both the sternum and the upper extremity of *Pterocles* are quite columbine in character, especially the former. Its sternum has considerably more pigeon than it has grouse in it, and as this bone is often seized upon by some avian classifiers as *the* index of a bird's systematic position and its affinities, it may account for the sand grouse having been placed upon the columbine side of the line in certain schemes of classification.

With a strong columbo-tetraonine tincture in it, the pelvic limb of *Pterocles arenarius* has characters in it not commonly, if ever, found in those allied groups. In *P. arenarius* (No. 18,849, Coll. U. S. Nat. Mus.) the first metatarsal coössifies with the tarso-metatarsus; is high up on the shaft; and the basal hallucial joint, with its unequal phalanx, is very rudimentary. There are but three joints and a claw in either outer podal digit; while the limb below the knee (there being no patella) is well supplied with sesamoids. One great grooved one is found back of the tibio-tarsal condyles, and two or three small ones in the sole of the curious foot of this bird. Air does not gain access into the shafts of the long bones of the pelvic limb of *Pterocles*; and this also holds true for *Syrrhaptes* (Parker).

As to the systematic position of the sand grouse, it may be briefly said that there is altogether too much grouse in the skull of *Pterocles* to admit of its being arrayed with the Columbæ; while, on the other hand, there is too much pigeon in both *Pterocles* and *Syrrhaptes* to admit of placing either of these genera in the tetraonine assemblage. The place they really hold is an intermediate one, and this is best shown, I think, and the ends of classification best served, by arraying them in a separate group,—the suborder *Pterocles*, standing between the Galli and the Columbæ.